# A COFFEE MACHINE WITH A MANUALLY OPERATED LID OF AN INLET FOR SPECIAL COFFEE AND A METHOD FOR MONITORING THE POSITION OF THIS LID

The invention relates to a coffee machine with a manually operated lid of an inlet for special coffee according to patent claim 1 and a method for monitoring the position of this lid according to patent claim 5.

In particular, the invention relates to a coffee machine, controlled by a processor, with an integrated coffee grinder and a powder chute whereby the powder chute serves as a feed line for ground coffee from the coffee grinder to a moveable brewing cylinder and, in addition, has an inlet for already ground special coffee, said inlet having a manually operated lid.

The method in terms of the invention relates to the monitoring of the position of the manually operated lid by the processor for the purpose of the correct initialisation of the operating mode for a subsequent coffee preparation cycle.

Generically similar coffee machines are known, for example, from DE-G-295 08 248.8 and EP-0 658 339. The first shows a device for dosing coffee powder, the latter a method and an arrangement for cleaning a brewing device of a coffee machine. The two documents show that the procedures for dosing, dosing control and cleaning of coffee machines with movable brewing cylinders are well known.

Since for coffee machines of this or similar construction there is always the possibility to alternatively also pour already ground special coffee through a powder chute, which is available anyway, instead of (in the coffee machine) freshly ground coffee, these machines are often equipped with an additional, manually operated flap to provide an

inlet for already ground special coffee in the powder chute.

Today, many coffee machines offered commercially have indeed a manually operated flap to actually provide an inlet for already ground special coffee.

What in these cases is often solved in an unsatisfactory manner, however, is the operation and the operating sequence during the production of special coffee. Thus, in order to trigger the making of a special coffee, the selection has to be made manually at the beginning with the aid of a pre-selection via operating elements. Based on such a pre-selection, the machine 'expects' that the manual filling of special coffee via the additionally available, manually operated flap has to take place as the next operating step. Faulty operations occur particularly if the pre-selection mentioned above has not been carried out. Then there is a risk of overfilling.

It is an object of the present invention to provide a generic coffee machine which can be operated more easily and which is less prone to malfunctions.

This object is solved by the characteristic features mentioned in patent claims 1 and 5.

The solution includes that a sensor is available for detecting the position of the manually operated lid of the inlet for the already ground special coffee, that the detection signal of the sensor is passed on to a processor controlling the coffee machine, and that, in addition, the detection signal is used by the processor for differentiating between a normal operating mode and an operating mode for producing special coffee. If the processor has registered, in that manner, that the lid has been open for a certain minimum time span, a subsequent

coffee making cycle in the operating mode for producing special coffee will be initialised.

The advantages resulting from this can be seen, in particular, in the fact that a user who would like to have special coffee, no longer has to make a manual pre-selection. Rather, the coffee machine itself detects this intention automatically as a result of monitoring the manually operated lid of the inlet for the already ground special coffee. After adding special coffee to the machine, the user merely needs to determine a quantity (of water) and trigger the brewing process.

In the simplest case, the detection of this intention occurs simply by the machine registering that the manually operated lid of the inlet for the already ground special coffee has been open for a certain minimum time span. Although this does not guarantee that ground special coffee has indeed been added, it can be assumed that this would be the case in most instances. Thus, as a consequence, a coffee preparation cycle in an operating mode for producing special coffee can already be initialised.

Naturally, further measures can be provided to ensure that a filling process of adding special coffee can be detected as reliably as possible. Such measures are described in the subordinate claims.

One of these measures can be implemented in a relatively simple manner by using a generic coffee machine where the brewing cylinder can be swung into an operating position with a brewing unit, where the brewing unit has an adjustable brewing piston that can be advanced into the brewing cylinder, and where an adjustment position of the brewing piston is detectable and can be registered by the processor. In these cases, the stored adjustment position of the brewing piston in the operating mode for producing

special coffee can serve the purpose of determining the presence and the present quantity of special coffee in the brewing cylinder. Namely, this is the case if the brewing piston is advanced or immersed into the brewing cylinder filled with special coffee, and the brewing piston does not reach its end position near the bottom of the brewing cylinder. Based on the immersion depth, not only can the presence of coffee in the brewing cylinder be determined, but also the current quantity of added coffee.

A further, more direct measure for determining whether a filling process with special coffee has taken place consists of placing additional detection means in the powder chute. These additional detection measures register filling processes when the lid is open. The brewing process in the operating mode for producing special coffee is initiated only if the processor, based on the signals of the additional detection means, has detected that special coffee has indeed been added. The sensors used here have to be capable of reliably detecting the filling process which makes especially high demands on the sensors in an environment which, by its nature, is subject to a considerable contamination with (coffee) powder dust, and it also usually requires additional filter methods in the processor in order to avoid or at least reduce false detections.

A preferred embodiment for implementing the invention is subsequently explained with the aid of figures. They are:

Fig. 1 a coffee machine with a manually operated lid of an inlet for special coffee with its lid being open and a brewing cylinder in filling position, and

Fig. 2 a coffee machine according to Fig. 1 with the lid closed and the brewing cylinder in brewing position.

Fig. 1 shows a coffee machine in terms of the invention with an integrated coffee grinder 1 and a powder chute 2 where the powder chute serves the purpose of feeding ground coffee 3 from the coffee grinder 1 to a movable brewing cylinder 4 and is equipped with an inlet 6, provided with a manually operated lid 5, for the already ground special coffee. The lid 5 in this illustration is shown open. The brewing cylinder 4 is arranged so that it can be pivoted around a pivot point 7 and it is set in the so-called "filling position" where ground coffee (normal coffee from the coffee grinder 1 or special coffee from inlet 6) can be filled into the brewing cylinder 4 via the powder chute 2 and a feed funnel 8. Here, it is assumed that special coffee has been added via the inlet 6 and that, therefore, ground material 9 is present in the brewing cylinder 4.

The manually operated lid 5 can, for example, be designed as a flap or as a slider.

Furthermore, the coffee machine has a brewing unit 10 with a brewing piston 11 which can follow a linear motion in the brewing unit 10 and which can be extended into and retracted from the brewing cylinder 4. The brewing piston 11 can be moved and adjusted in a linear manner by a motor 12 and the adjustment position of the brewing piston 11 is detected and measured by a position encoder 13. Because in this illustration the brewing cylinder 4 is shown in the "filling position", the brewing piston 11 is retracted here and it is located in the brewing unit 10.

The position of lid 5 of the inlet 6 is monitored by a sensor 14. The sensor 14 detects the position of the lid 5 and sends a detection signal to a processor 15 controlling

the coffee machine. The detection signal is used by the processor 15 to differentiate between a normal operating mode and an operating mode for producing special coffee. It is assumed that a coffee preparation cycle in an operating mode for producing special coffee should occur each time the lid 5 has been opened for a certain minimum time span.

The sensor 14 can be a common limit switch, for example, or a unit working without direct contact.

As has been mentioned, the functions and sequences of the coffee machine are controlled by the processor 15. The arrangements and connections for performing this control function are illustrated in a schematic manner only because they would be generally familiar to those skilled in the art. Thus, the processor 15 not only has connections to the motor 12 and the sensor 14, but also to a memory 16 (program and data memory), to an operating and display panel 17 and to a grinder motor 18 for the coffee grinder 1.

In Fig. 2, it is assumed that the filling process of adding ground coffee into the brewing cylinder 4 has been completed. The ground material 9 is present in the brewing cylinder 4. The brewing cylinder 4 has been swung into a so-called "brewing position" where the brewing piston 11 of the brewing unit 10 can be extended into the brewing cylinder 4 by motor 12. Here, the brewing piston 11 is extended to a point where the ground material 9 will be slightly compressed. The adjustment position reached by the brewing piston 11 is then measured by the position encoder 13 and passed on to the processor 15. Based on the values detected (pressure/position), the processor 15 can decide whether the parameters are within the specifications and whether the brewing process should be started.

For a brewing process with normal coffee from the coffee grinder 1, the latter delivers the 'correct' quantity of coffee so that the brewing process can normally be started without further delay.

Prior to triggering a brewing process with special coffee (added via inlet 6), the processor 15 can determine via the stored adjustment position of the brewing piston 11 (immersion depth of the brewing piston in the brewing cylinder), which itself is based on the detected measured values of the position encoder 13, whether too little or possibly too much ground material 9 has been filled in. If the brewing piston 11 reaches an end position near the bottom of the brewing cylinder, it can be assumed that obviously no ground special coffee has been added. If too much special coffee has been added, it can be expected that, for the time being, some part of the filled in special coffee remains in the feed funnel 8 and possibly causes further problems later on.

Thus, with a generic coffee machine, if it is monitored whether the lid 5 of inlet 6 remains open for a minimum time span, it merely represents an indication for the decision as to whether a special coffee should be produced. One needs to bear in mind, though, that the filling process in itself, namely the trickling through of ground special coffee through the powder chute 2 while the lid 5 is open, is not detected directly but is merely deduced as a probable subsequent process-stop. However, in most cases, the monitoring of the position and the opening duration of lid 5 of the powder chute 2 should be sufficient to achieve a satisfactory functional certainty.

But still further and in part more direct measures can be provided in order to detect the filling process for special coffee as reliably as is at all possible.

As has already been mentioned above, with generic coffee machines with adjustment positions of the brewing piston 11, which can be measured and stored, it can be detected, at least in an indirect manner, whether a filling operation for special coffee has indeed taken place. For this should be the case, precisely, when the brewing piston 11 (in brewing position) has approximately reached its specified position in the brewing cylinder 4 and has not advanced to its end position near the bottom of the brewing cylinder 4. Thus, it is possible to only start the brewing process in the operating mode for producing special coffee if the processor 15 can detect, based on a measured and stored adjustment position of the brewing piston 11, that special coffee is present in the brewing cylinder 4.

Additional detection means (not shown) in the powder chute 2 can be present, for example, which can detect the trickling through of ground special coffee through the powder chute 2 while the lid 5 is open. Such detection means can be designed as contamination-impervious light barriers, as other sensor elements operating without contact, as motion-sensitive sensor elements, or also as contact-sensitive detection means. Thus, it is possible to only start the brewing process in the operating mode for producing special coffee if the processor 15 can detect, based on the signals of the additional detection means, that special coffee has been added.

Since the detection means mentioned above are naturally exposed to a considerable contamination with (coffee) powder dust, it makes especially high demands on the sensors and, furthermore, it also requires the application of additional signal filter methods in the processor in order to avoid or at least reduce false detections.

Needless to say, the proposed measures can be implemented either individually or in combination.